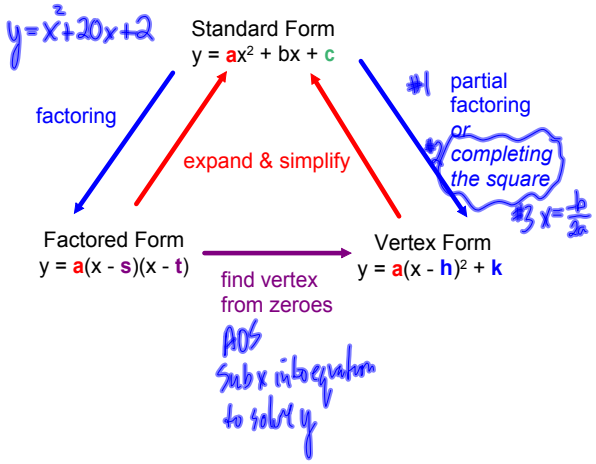
4.5 - Relating Three Forms of a Quadratic Equation



AOS
Sub x into equation to solve y

Ex.1 Expand & simplify each equation to obtain the standard form equation.

(a) $y = 2(x + 5)(x - 1)$

$= (2x+10)(x-1)$

$= 2x^2 - 2x + 10x - 10$

$= 2x^2 + 8x - 10$

$= 2(x+5)(x-1)$

$= 2(x^2 + 4x - 5)$

$= 2x^2 + 8x - 10$

(b) $y = -0.5(x - 4)^2 + 3$

$= -0.5(x-4)(x-4) + 3$

$= -0.5(x^2 - 8x + 16) + 3$

$= -0.5x^2 + 4x - 8 + 3$

$= -0.5x^2 + 4x - 5$

Ex.2 Write $y = x^2 - 4x + 3$ in factored form and vertex form.

$y = x^2 - 4x + 3$

$= (x-1)(x-3)$

M A N

3 -4 -1, -3

$-1 + -3 = -4$

① factor
② find zeroes
③ AOS
④ sub x=2 into equation

$x - 1 = 0$ or $x - 3 = 0$

$x = 1$ $x = 3$

$AOS = \frac{1+3}{2}$

$x = 2$

Sub x=2 into equation

$y = (2)^2 - 4(2) + 3$

$= 4 - 8 + 3$

$= -1$

$y = (x-2)^2 - 1$

Ex: Determine the vertex, and the vertex form, of $y = x^2 - 12x + 5$

$y = x^2 - 12x + 36 - 36 + 5$

$y = (x-6)^2 - 31$

#1 $\frac{-12}{2} = -6$

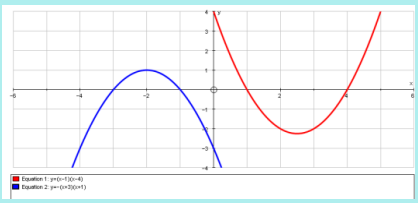
$(x-6)^2$

#2 $(-6)^2 = 36$

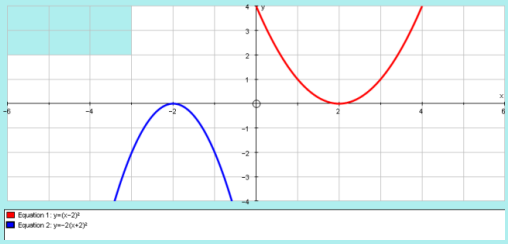
$+36 - 36$

If the parabola crosses the x-axis, the x-coordinates of the crossing points are called the zeroes, or roots, or x-intercepts.

A parabola may have two zeros:

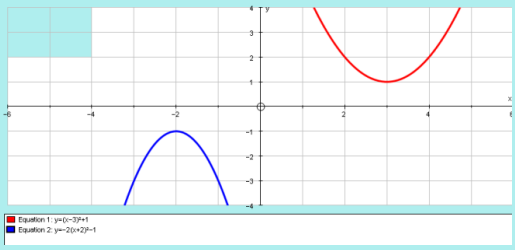


Or one zero:



$(x \pm \#)^2$

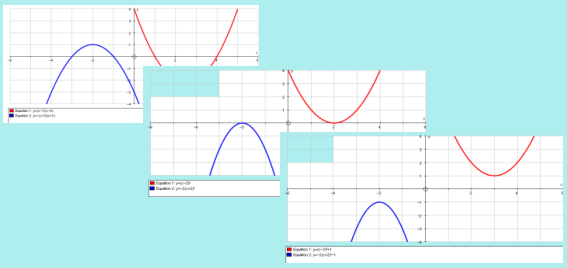
Or no zeroes:



Recall:

(1) Factored form indicates the zeroes of the quadratic relation.

(2) A quadratic relation can have 2, 1, or no zeroes.



Not all quadratics have zeroes, which means they cannot be factored. Instead, use symmetry to perform a partial factoring.

1) Determine two points that have the same y-value.
   - start with a point that is given and then find the matching point with the same y-value
   - the y-intercept is usually a good choice

2) Find the x-value of the vertex (h) using symmetry

3) Find the y-value of the vertex (k) by subbing h into the original equation.

Ex.3 Determine the vertex, and the vertex form, of $y = x^2 - 12x + 5$

y-intercept (0,5) (x,5)

by symmetry, there is another point where y=5, sub y=5, solve for x

$y = x^2 - 12x + 5$

$5 = x^2 - 12x + 5$

$5 - 5 = x^2 - 12x$

$0 = x^2 - 12x$ GCF

$0 = x(x - 12)$

$(x-0)(x-12)$

$x-0=0$ $x=0$ $x-12=0$ $x=12$

$x=0$ or $x-12=0$, $x=12$

Sub x=6 into equation

$y = x^2 - 12x + 5$

$= (6)^2 - 12(6) + 5$

$= -31$

$AOS = \frac{0+12}{2}$

$x = 6$

$y = (x-6)^2 - 31$

Ex. 4 Determine the vertex, and the vertex form, of $y = -3x^2 + 15x + 2$

y-intercept

$2 = -3x^2 + 15x + 2$

$2 - 2 = -3x^2 + 15x$

$0 = -3x^2 + 15x$ GCF

$0 = -3x(x - 5)$

$-3x=0$ $x=0$ or $x-5=0$ $x=5$

Sub x=2.5 into equation

$y = -3x^2 + 15x + 2$

$= -3(2.5)^2 + 15(2.5) + 2$

$= 20.75$

$AOS = \frac{0+5}{2}$

$x = 2.5$

$y = -3(x-2.5)^2 + 20.75$

Assigned Work:

p.293 # 4c, 5a, 6a, 9ac, 10c
p.301 # 4c, 5ae, 7c